

REMARKS

Claim 1 has been amended by limiting the mercaptan containing olefinic naphtha feedstream to one which has previously been hydrodesulfurized. Support for this amendment can be found on page 4, lines 5-7 of the instant specification. Claim 1 has also been amended by inserting the word "when" after the word "wherein" as suggested by the Examiner.

Applicants request that the Examiner enter this amendment in order to place this application in condition for allowance or in better form for appeal.

Applicants' attorney notes that the Examiner has withdrawn his objection to the Abstract, as well his rejection under 35 U.S.C. 112, second paragraph.

Claim Objections

Claim 1 has been objected to because of lack of the word "when" after the word "wherein" in lines 7 and 9 of claim 1.

Applicants have amended claim 1 as suggested by the Examiner and therefore request that the Examiner withdraw this objection.

The Examiner notes that the instant application names joint inventors and presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made. The Examiner's presumption is correct. All claims in the instant application, as filed, and as amended are commonly owned by ExxonMobil Research and Engineering Company.

First Rejection Under 35 U.S.C. 103(a)

Claims 1-4 have been rejected under 35 U.S.C. 103(a) as being obvious in light of United States Patent No. 5,554,275 to Harandi.

Examiner's Position

The Examiner again notes that the Harandi patent discloses a process for desulfurizing a hydrocarbon feed by introducing a liquid hydrocarbon into the top of a stripper containing a bed of hydrodesulfurization catalyst particles. The liquid hydrocarbon is passed downwardly and through the bed of catalyst wherein a hydrogen-containing treat gas is introduced at the bottom of the stripper and is passed counter-current to the downward flowing hydrocarbon feed. The catalyst may be a Group VI and Group VIII metal catalyst such as cobalt-molybdenum on a support, such as alumina.

Also, the Examiner again points out that Harandi does not disclose the presence of mercaptans in the hydrocarbon feed, and does not disclose a cocurrent system. The Examiner again takes the position that it would have been obvious to use the Harandi teaching to convert the mercaptans present in the instant feeds.

Applicants' Position

Harandi does not teach or suggest the instantly claimed invention. Harandi discloses a process wherein hydrodesulfurization and stripping are conducted in the same vessel - a stripper. The top section of the stripper of Harandi contains a bed of hydrodesulfurization catalyst with a hydrogen treat gas flowing counter-current to the downflowing hydrocarbon feedstream. Mercaptans were not a problem for Harandi. If mercaptans were to form in the Harandi process from the reaction of olefins with hydrogen sulfide, they would not be as serious a problem

as those formed in the instantly claimed invention. This is because the emphasis of the Harandi invention is directed to feeds lighter than gasoline, whereas gasolines are the primary feeds of the instantly claimed invention. The preferred feeds of Harandi are C₃-C₅ streams as disclosed in column 1, lines 32-33 of his patent. The formation of mercaptans during the processing of gasoline streams is serious since they have an adverse affect on octane number.

As now amended, the presently claimed invention covers the decomposition of mercaptan sulfurs after a prior and separate hydrotreating step. Therefore, the feedstreams utilized by the instant invention can be considered the effluent streams of the Harandi patent which results from the selective hydrotreatment of the feedstock. In essence, the presently claimed invention takes the effluent from selective hydrotreating such as that described in Harandi, and further treats it to decompose at least a portion of the mercaptan sulfurs.

Harandi does not suggest nor disclose the use of the presently claimed process to remove mercaptan sulfurs from a previously hydrodesulfurized naphtha stream. Rather, Harandi discloses only treating a light hydrocarbon stream in a stripper to selectively remove organosulfur compounds while stripping the resulting hydrogen sulfide with a counter-current flowing hydrogen treat gas. Although Harandi does mention in passing that heavier streams can be used in his invention, but he never recognized the unique problems of mercaptan formation with respect to heavier feeds, such as gasoline streams.

It is also applicants' position that Harandi in fact teaches away from the instantly claimed invention by his statement in column 1, lines 14-19 which reads:

“Prior processes have required a separate selective hydrodesulfurization step to remove reactive organosulfur compounds, such as thiophenes. Volatile feedstreams also contain lower alkanes and alkenes,

such as ethane, ethane, methane, H₂S and impurities which are removed in a separate stripping tower."

Thus, it is applicants' position that one of ordinary skill in the art, reading Harandi, would not be lead to instantly claimed invention.

Therefore, the Examiner is requested to reconsider and withdraw this rejection.

Second Rejection Under 35 U.S.C. 103(a)

Claims 5-7 and 14 have been rejected under 35 U.S.C. 103(a) as being obvious in light of Harandi and further in view of Jossens et al.

Examiner's Position

The Examiner states that Harandi does not disclose the use of a hydrodesulfurized feed or the step of hydrodesulfurizing a hydrocarbon to produce the feed, but Jossens et al is cited as disclosing a mild hydrotreatment step that results in a hydrotreated stream that still contains mercaptans and these mercaptans can be removed by further treatment. The Examiner concludes by saying that it would have been obvious to one having ordinary skill in the art at the time the instant invention was made to have modified the process of Harandi by hydrotreating a hydrocarbon to produce the feed as suggested by Jossens et al. because the initial mild hydrotreating of Jossens et al. retains olefin content while increasing mercaptan.

Applicants' Position

It is applicants' position that Jossens et al. teaches a two-step mild hydrotreatment process wherein a sulfur-containing stream is hydrotreated under

mild conditions followed by an extraction step using either a solid sorbent or a liquid extractant to remove sulfur compounds from the hydrotreated stream.

As previously discussed, and as amended, the presently claimed invention involves the treatment of a previously hydrodesulfurized feedstock. This previously hydrodesulfurized feedstock is again hydrodesulfurized, but at conditions that will cause decomposition of at least a portion of the mercaptans, which are then removed by use of a stripping gas.

It is applicants' position that one having ordinary skill in the art and knowledge of Harandi and Jossens would not have arrived at the presently claimed invention. One having ordinary skill in the art would have been taught to remove mercaptans through the use of a solid absorbent as described in Jossens et al. at column 2, lines 65-67.

It is also applicants' position that there would be no motivation for one having ordinary skill in the art to combine the teaching of Harandi with the teaching of Jossens et al. If one were interested in decomposing mercaptans in a gasoline stream, why would one be motivated to look to a teaching, such as Harandi's, that does not teach the presence of mercaptans and whose primary interest is feeds that are lighter than gasoline feeds. The teaching of Harandi would not lead to either the instantly claimed invention or even to the Jossens et al. invention.

Further, claims 5-7 and 14 are dependent claims. Dependent claims, by definition, contain all of the limitations of the claims from which they depend. Thus, claims 5-7 and 14 contain all of the limitations of claim 1 which applicants maintain is patentable over the cited art. Since independent claim 1 is novel and

patentable, the uses and variations in the dependent claims of the novel invention claimed in the independent claims are also novel and unobvious.

Therefore, applicants request that the Examiner reconsider and withdraw this rejection.

Based on the preceding arguments and amendments, the Examiner is requested to withdraw the rejections and objections as to the present claims and pass the application to allowance. The Examiner is encouraged to contact applicants' attorney should he wish to discuss this application.

Respectfully submitted,

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MARKED-UP CLAIMS ACCOMPANYING RESPONSE TO
FINAL OFFICE ACTION FOR USSN 09/676,875

1. (Twice Amended) A method for decreasing sulfur levels in a previously hydrodesulfurized mercaptan sulfur containing olefinic naphtha feedstream comprising the steps of passing said mercaptan sulfur containing olefinic naphtha feedstream over a fixed bed catalyst in a three phase, gas, liquid, solid system in the presence of a stripping gas, for a time and temperature and pressure sufficient to decompose at least a portion of said mercaptans to produce olefins, H₂S, as an off gas, and a hydrocarbon product stream having decreased amounts of mercaptan sulfur from said H₂S and said stripping gas and wherein when said stripping gas is a gas stream comprising hydrogen, said fixed catalyst bed comprises (a) a non-reducible metal oxide or (b) a Group VIIIB metal promoted Group VIB catalyst, and wherein when said stripping gas is an inert gas said fixed bed catalyst comprises a Group VIIIB metal promoted Group VIB catalyst.

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